FINAL

WASTE ROCK AND TAILINGS VOLUMES TECHNICAL MEMORANDUM

CARPENTER-SNOW CREEK MINING DISTRICT NPL SITE SUPPLEMENTAL STUDIES FOR THE REMEDIAL INVESTIGATION CASCADE COUNTY, MONTANA

March 2013

Prepared for:

Montana Department of Environmental Quality
Remediation Division
P.O. Box 200901
Helena, Montana 59620

U.S. Environmental Protection Agency – Region 8
10 West 15th Street
Helena, Montana 59626

Prepared By:

Tetra Tech EM Inc.
7 West 6th Avenue, Suite 612
Helena, Montana 59601
(406) 442-5588

CONTENTS

CONTENTS (Cont.)

Tables

FIGURES

ACRONYMS AND ABBREVIATIONS

3D	Three dimensional
CSCMD	Carpenter-Snow Creek Mining District
cy	Cubic yard
DEQ	Montana Department of Environmental Quality
EPA	U.S. Environmental Protection Agency
LTP	Lower Tailings Pile
NPL	National Priorities List
OU2	Operable Unit 2
POG	Presumed original grade
RI	Remedial investigation
Tetra Tech	Tetra Tech, Inc.
UTP	Upper Tailings Pile
USFS	U.S. Forest Service

1.0 INTRODUCTION

The Montana Department of Environmental Quality (DEQ), in cooperation with the U.S. Environmental Protection Agency (EPA) and the U.S. Forest Service (USFS), tasked Tetra Tech EM Inc. (Tetra Tech) to fill data gaps for the remedial investigation (RI) at Operable Unit 2 (OU2) of the Carpenter-Snow Creek Mining District (CSCMD) National Priorities List (NPL) site. The CSCMD site is in Cascade County, and occupies an area from approximately 4 miles northeast of Neihart, Montana, southwest through town and ending just southwest of Neihart (Figure 1-1). Mine tailings, waste rock, and acid mine drainage are present throughout the site. Previous investigations showed that the waste rock and tailings have elevated concentrations of arsenic, cadmium, copper, lead, and zinc and they may pose a risk to ecological receptors from surface water, groundwater, soil, and sediment, and to human recreational and residential users. Remediation of the site will be necessary if concentrations of contaminants in waste rock, tailings, soil, and groundwater pose unacceptable risks to human health or ecological receptors.

Tetra Tech prepared this technical memorandum for the DEQ under Contract Number 407026, Task Order 100, to summarize the known extent and volume of the surface wastes in the Carpenter and Snow Creek watersheds and on the Neihart Slope. This memorandum details the investigation activities and estimated waste volumes in those areas. The Upper Tailings Pile (UTP), Lower Tailings Pile (LTP), and streamside tailings volumes are not discussed in this memorandum.

The remainder of this technical memorandum contains:

- The site history for the areas,
- The methods used for surveying the waste volumes, and
- The volume of waste rock and tailings at the site.

2.0 SITE HISTORY

The Neihart Mining District was a major silver producer in the state and the primary producer in Cascade County, producing about $16 million in silver between 1882 and 1929 (Sahinen 1935; GCM 1991). The first claim in the district was made in July 1881. Development slowed during the mid- to late-1880s, then began to increase again after construction of the Great Falls smelter and the Belt Mountain branch of the Great Northern Railroad in 1891, connecting Neihart with Great Falls.

The town of Neihart is southwest of the Carpenter – Snow Creek drainage. The estimated population of Neihart is 85 (City-Data.com 2011). Many more people who own property in and around Neihart use the residential structures for seasonal recreation. For this investigation and access purposes, OU2 of the Carpenter-Snow Creek NPL Site was divided into three geographical areas, the Carpenter Creek watershed, the Snow Creek watershed, and the Neihart Slope (Figure 1-1).

The Carpenter Creek watershed is approximately 2 miles northeast of the town of Neihart and includes the Haystack Creek, Sih-Mem Creek, and Lucy Creek watersheds. The DEQ Abandoned and Inactive Mines Database lists 24 abandoned or inactive mines in the watershed. The main mine in the watershed and largest ore production mine at the site was the Silver Dyke Mine.

The Snow Creek watershed is approximately 1 mile northeast of Neihart. The DEQ Abandoned and Inactive Mines Database lists 14 abandoned or inactive mines in the watershed. The Big Seven Mine was the predominant mine that operated in the upper Snow Creek area. There were several mills along Snow Creek and its tributaries but the absence of large tailings piles suggests that there was little production.

The Neihart Slope encompasses the eastern hillside directly above the town of Neihart. The DEQ Abandoned and Inactive Mines Database lists 33 abandoned or inactive mines on the slope, the largest of which were the Queen of the Hills, the Broadwater, and the Moulton.

Tetra Tech was tasked with determining mine waste rock and tailings volumes that remains within all three areas of the site. The three areas of focus for the mine waste volume investigation were the Carpenter Creek watershed, the Snow Creek watershed, and the Neihart Slope. These areas were chosen because they exhibited the most extensive mining activities and are the areas of focus for the current RI. Each area contains numerous adits, waste rock piles, and other mining features as the result of heavy mining exploration and development.

3.0 METHODS

The following sections describe the methods used to survey the surface waste piles throughout the site.

3.1 SURVEYING

To determine mine waste volumes, Tetra Tech first examined aerial photos to identify mine waste piles throughout the CSCMD NPL site. Field personnel went to each pile and surveyed the perimeters and topography of the piles that appeared to have a volume of surficial waste greater than 100 cubic yards (cy). A Trimble R8 GNSS System was used to survey the piles. The location of each pile surveyed in Carpenter Creek, Snow Creek, and the Neihart Slope are shown in Figures 4-1, 4-2, and 4-3 respectively.

Field survey data were downloaded each night and uploaded to Tetra Tech's main server. Tetra Tech loaded the survey data points into AutoCAD Civil 3D. Perimeter points and topographic maps were used to create a "presumed original grade" (POG) that is the presumed original ground surface before waste was placed at the site. The topographic points were used to create the current surface topography for each pile. The POG and current surface topography were combined to create a three-dimensional (3D) model of each pile. A 3D model and cross section of each pile, along with a site location map, are shown in the waste volume figures included in Appendix A.

4.0 WASTE ROCK AND TAILINGS VOLUMES

The following sections describe the waste rock and tailings piles surveyed throughout the site.

4.1 CARPENTER CREEK WASTE VOLUMES

The following sections discuss the tailings and waste rock piles and volumes in the Carpenter Creek watershed. The locations of the waste are shown on Figure 4-1. The volumes of each pile surveyed are in Table 4-1. The volume of waste surveyed in the Carpenter Creek watershed was 137,000 cubic yards (cy).

4.1.1 Tailings

Tetra Tech surveyed one large tailings pile in the Carpenter Creek watershed. The tailings pile is east of Pioneer Road at the location of a former tailings dam. The volume of the tailings pile was 32,800 cy. The UTP and LTP were surveyed during a previous investigation and their volumes are not included.

4.1.2 Waste Rock

Five waste rock pile sites were surveyed in the Carpenter Creek watershed. At four of the five sites, there were multiple waste rock piles present. Volumes for each pile are in Table 4-1.

4.2 SNOW CREEK WASTE VOLUMES

The following sections discuss the tailings and waste rock piles and volumes in the Snow Creek watershed. The locations of the waste are shown on Figure 4-2. The volumes of each pile surveyed are in Table 4-2. The total volume of waste surveyed in the Snow Creek watershed was 112,500 cy.

4.2.1 Mining Complexes

The Big Seven mining complex was surveyed for waste rock volume. There was one waste rock pile at the complex with a volume of 1,765 cy.

4.2.2 Tailings

One tailings pile suspected to be the location of a former tailings impoundment was surveyed in the Snow Creek watershed. Its volume was 10,950 cy.

4.2.3 Waste Rock

Fifteen waste rock pile sites were surveyed in the Snow Creek watershed. At three of the 15 sites, there were multiple waste rock piles present. Volumes for each pile are in Table 4-2.

4.3 NEIHART SLOPE WASTE VOLUMES

The following sections discuss the waste rock piles and volumes at the Neihart Slope. No tailings piles were identified on the Neihart Slope. The locations of the waste piles are shown on Figure 4-3. The volumes of each pile surveyed are in Table 4-3. The total volume of waste surveyed on the Neihart Slope was 361,000 cy.

4.3.1 Mining Complexes

Five mining complex locations were surveyed for waste rock volume on the Neihart Slope. There were multiple waste rock piles at three of the complexes surveyed. Volumes for each individual pile are in Table 4-3.

4.3.2 Waste Rock

Seven waste rock pile sites were surveyed on the Neihart Slope. There were multiple waste rock piles at two of the sites surveyed. Volumes of each individual waste rock pile are in Table 4-3.

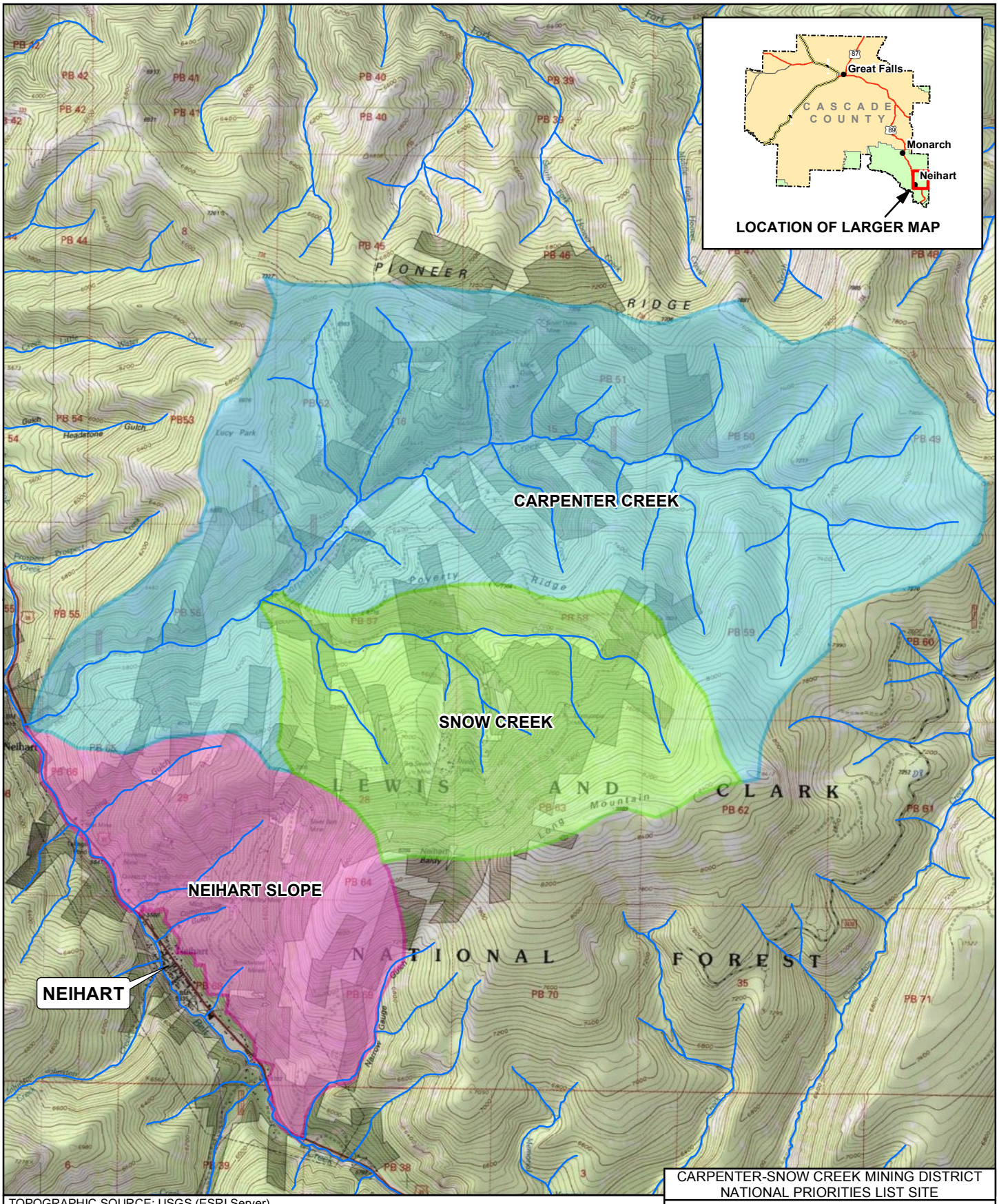
5.0 REFERENCES

City Data.com. 2011. Neihart population data. http://www.city-data.com/city/Neihart-Montana.html

GCM Services, Inc. 1991. Cultural Resource Inventory and Assessment of the Neihart Mining District. Prepared for L.C. Hanson Company. Butte.

Sahinen, Uuno M. 1935. "Mining Districts in Montana." Thesis, Montana School of Mines, Butte.

FIGURES



TOPOGRAPHIC SOURCE: USGS (ESRI Server)

LEGEND

DRAINAGE

0 0.2 0.4 0.6 0.8 1 Miles

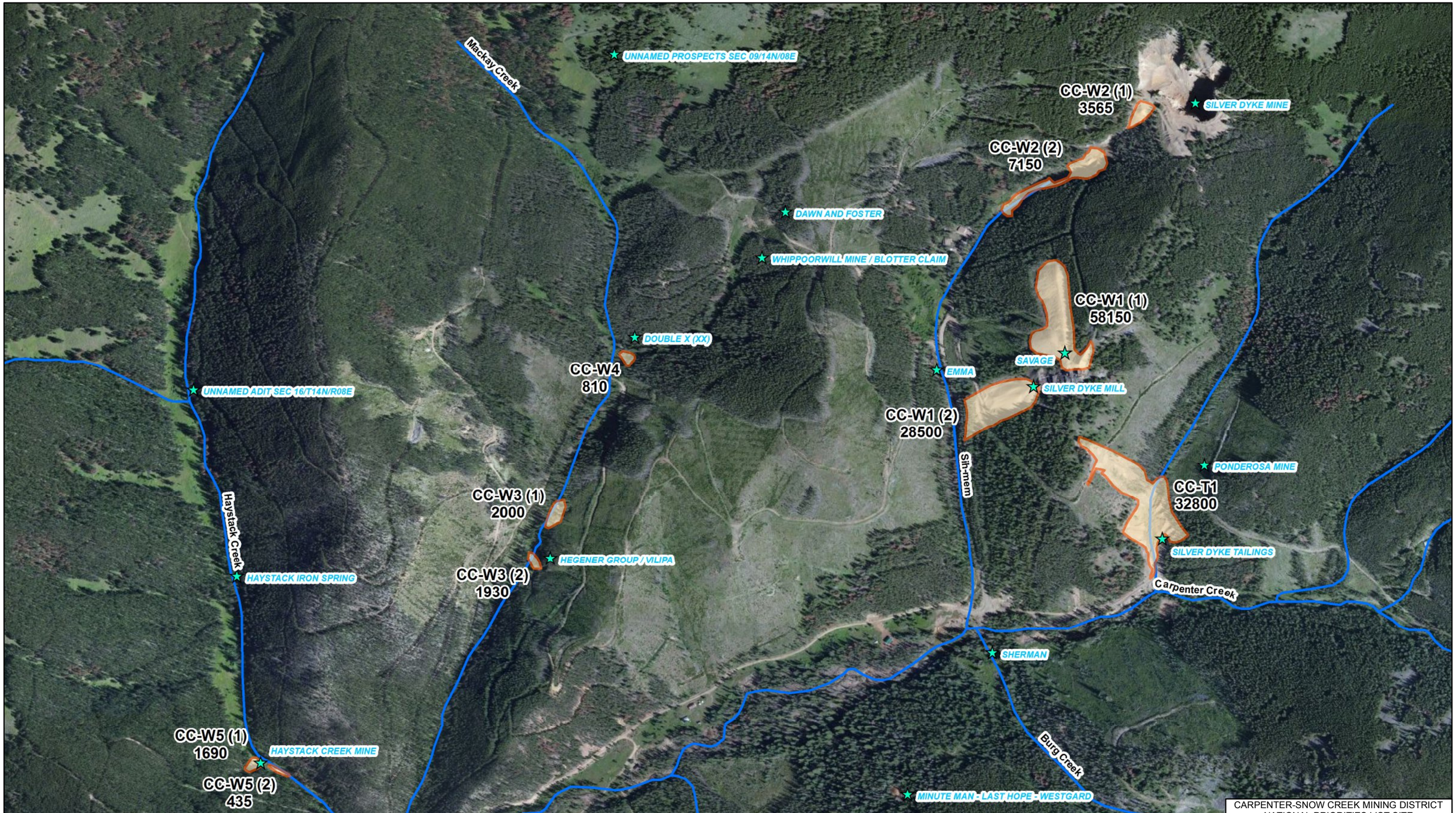
CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 1-1

INVESTIGATION LOCATION MAP
CARPENTER CREEK, SNOW CREEK,
AND NEIHART SLOPE DRAINAGES

TETRA TECH EM INC.

GIS MAP BY DOUG HEROLD TTEMI-HELENA - FIGURE_1-1_Investigation_Location_Map_121312.mxd



AERIAL IMAGERY SOURCE: BING SATELLITE IMAGE

LEGEND

- STREAM
- MINE
- WASTE LOCATION (WITH VOLUME OF WASTE IN CUBIC YARDS)

N

0 200 400 600 800 1,000 Feet

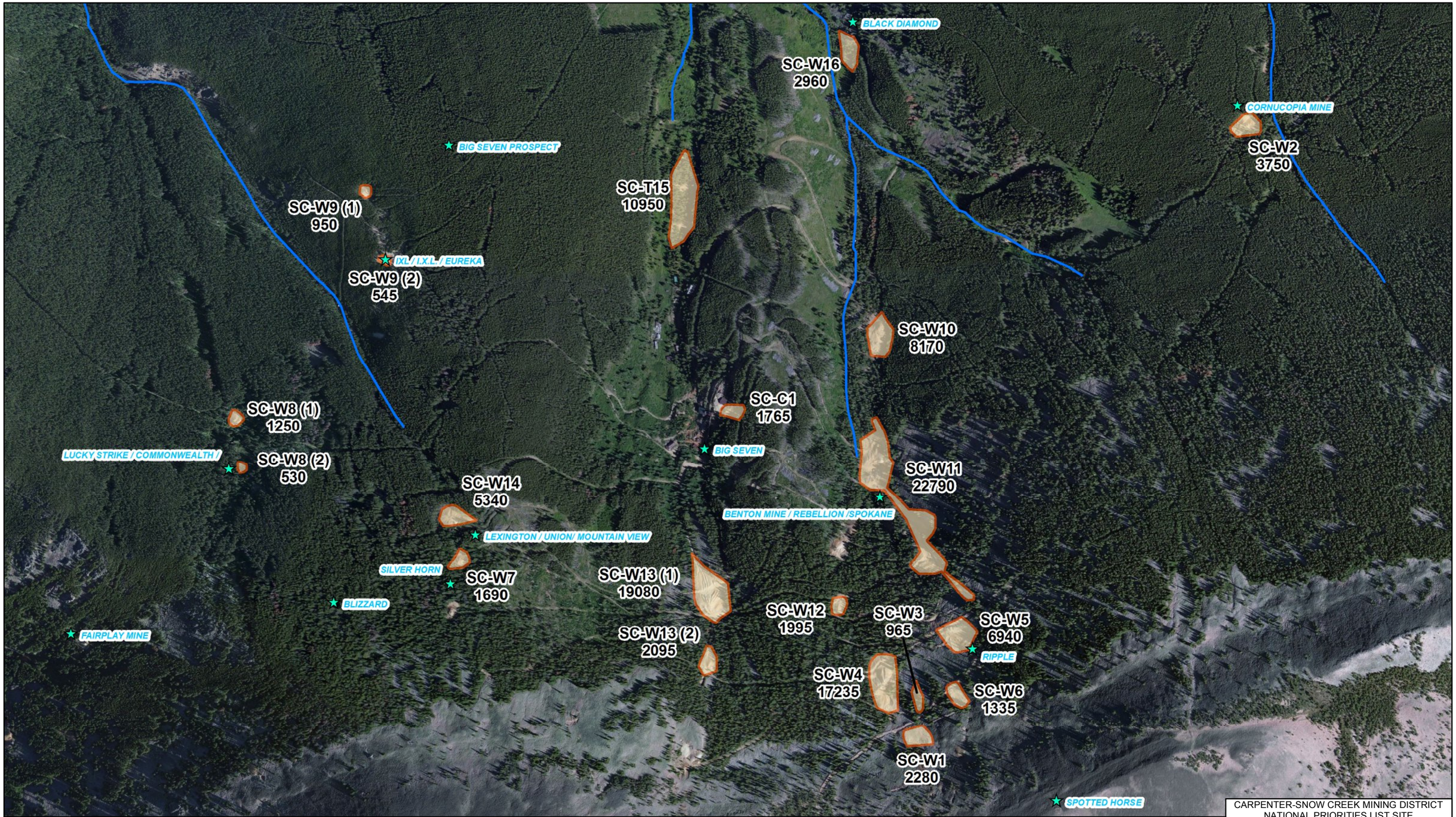
CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 4-1

CARPENTER CREEK
WASTE LOCATIONS

TETRA TECH EM INC.

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_4-1_Carpenter_Creek_Waste_Locations_022113.mxd



AERIAL IMAGERY SOURCE: BING SATELLITE IMAGE

LEGEND

- STREAM
- MINE
- WASTE LOCATION (WITH VOLUME OF WASTE IN CUBIC YARDS)

N

0 200 400 600 800 1,000 Feet

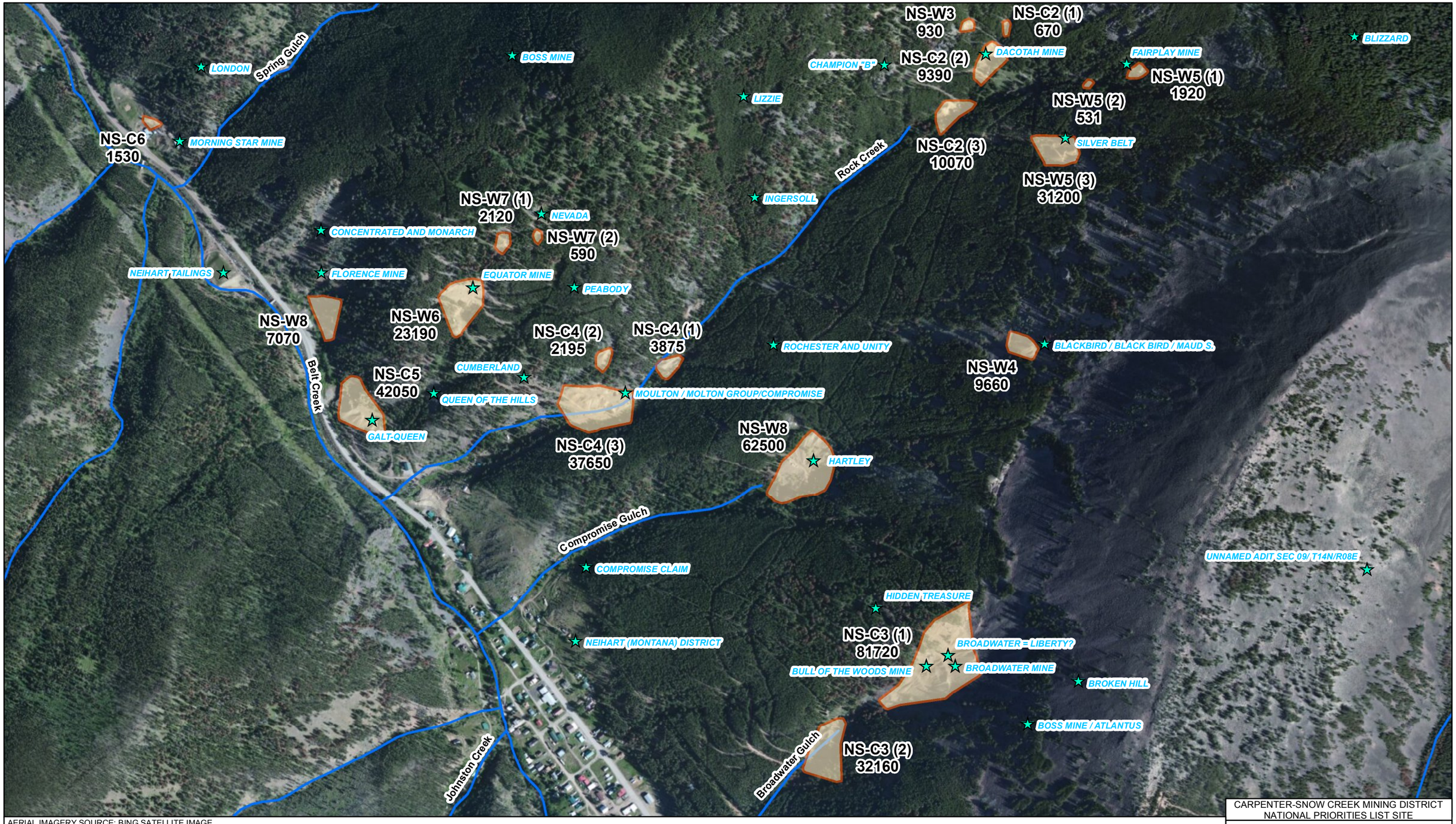
CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 4-2

SNOW CREEK
WASTE LOCATIONS

TETRA TECH EM INC.

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_4-2_Snow_Creek_Waste_Locations_022113.mxd



AERIAL IMAGERY SOURCE: BING SATELLITE IMAGE

LEGEND

- STREAM
- MINE
- WASTE LOCATION (WITH VOLUME OF WASTE IN CUBIC YARDS)

N

0 200 400 600 800 1,000 Feet

CARPENTER-SNOW CREEK MINING DISTRICT
NATIONAL PRIORITIES LIST SITE

FIGURE 4-3

NEIHART SLOPE
WASTE LOCATIONS

TETRA TECH EM INC.

GIS MAP BY DOUG HEROLD TTEMI-HELENA - Figure_4-3_Neihart_Slope_Waste_Locations_022113.mxd

TABLES

TABLE 4-1
CARPENTER CREEK WASTE VOLUMES

Location	Volume
	cy
CC-T1	32,800
CC-W1 (1)	58,150
CC-W1 (2)	28,500
CC-W2 (1)	3,565
CC-W2 (2)	7,150
CC-W3 (1)	2,000
CC-W3 (2)	1,930
CC-W4	810
CC-W5 (1)	1,690
CC-W5 (2)	435

Notes:
CC = Carpenter Creek
T = Tailings
W = Waste Rock
cy = Cubic yards

TABLE 4-2
SNOW CREEK WASTE VOLUMES

Location	Volume
	cy
SC-C1	1,765
SC-T15	10,950
SC-W1	2,280
SC-W2	3,750
SC-W3	965
SC-W4	17,235
SC-W5	6,940
SC-W6	1,335
SC-W7	1,690
SC-W8 (1)	1,250
SC-W8 (2)	530
SC-W9 (1)	950
SC-W9 (2)	545
SC-W10	8,170
SC-W11	22,790
SC-W12	1,995
SC-W13 (1)	19,080
SC-W13 (2)	2,095
SC-W14	5,340
SC-W16	2,960

Notes:
SC = Snow Creek
C = Mining Complex
T = Tailings
W = Waste Rock
cy = Cubic yards

TABLE 4-3
NEIHART SLOPE WASTE VOLUMES

Location	Volume
	cy
NS-C2 (1)	670
NS-C2 (2)	9,390
NS-C2 (3)	10,070
NS-C3 (1)	81,720
NS-C3 (2)	32,160
NS-C4 (1)	3,875
NS-C4 (2)	2,195
NS-C4 (3)	37,650
NS-C5	42,050
NS-C6	1,530
NS-W3	930
NS-W4	9,660
NS-W5 (1)	1,920
NS-W5 (2)	531
NS-W5 (3)	31,200
NS-W6	23,190
NS-W7 (1)	2,120
NS-W7 (2)	590
NS-W8	7,070
NS-W9	62,500

Notes:
NS = Neihart Slope
C = Mining Complex
W = Waste Rock
cy = cubic yards

APPENDIX A

WASTE VOLUME FIGURES

(available on CD only)